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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/734,999	12/12/2003	Eugene Marsh	MI22-2461	1993

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EXAMINER	
DUONG, KHANH B	

ART UNIT	PAPER NUMBER
2822	

DATE MAILED: 02/25/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

AK

Office Action Summary	Application No.	Applicant(s)	
	10/734,999	MARSH ET AL.	
	Examiner	Art Unit	
	Khanh B. Duong	2822	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *16 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *38-82* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *38-82* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *12 December 2003* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 12/12/03, 1/12/04, and 10/25/04
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

This Office Action is in response to the preliminary amendments filed December 12, 2003 and January 16, 2004.

Accordingly, claims 1-37 were cancelled, and new claims 77-82 were added.

Currently, claims 38-82 are pending.

Priority

This application is a continuation of application No. 10/229,887 filed August 27, 2002, now U.S. Patent No. 6,673,701.

Claim Objections

Claim 77 is objected to because of the following informalities: line 8, after "flow rate", "with" should be –which--. Appropriate correction is required.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 46-51 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 46-48 recite the limitation "the two immediately adjacent first precursor gas pulses" (emphasis added) in line 2 to 3. There is insufficient antecedent basis for this limitation in the claims.

Claims 49-51 recite the limitation "the two immediately adjacent pulses" (emphasis added) in line 2. There is insufficient antecedent basis for this limitation in the claims.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 38-43, 49, 50, 52-62, 74 and 75 are rejected under 35 U.S.C. 102(b) as being anticipated by Kim et al. (U.S. Patent No. 6,270,572).

Re claims 38, 39 and 74, Kim et al. ("Kim") discloses in FIGs. 10 and 11 a deposition method comprising: positioning a semiconductor substrate 4 within a deposition chamber 30; flowing a first precursor gas (first reactant) within the deposition chamber 30 to form a first monolayer on the substrate 4, said first precursor gas flowing comprising a plurality (two) of first precursor gas pulses (steps 105 & 115), at least two of the plurality of first precursor gas pulses separated by a period of time when no gas is fed to the chamber 30 (step 110) [see col. 5, line 21-24]; after forming the first monolayer on the substrate 4, flowing a second precursor gas (second reactant, step 125) different in composition from the first precursor gas within the deposition chamber 30 to form a second monolayer on the first monolayer; and flowing multiple time-spaced inert purge gas pulses (steps 130 & 140) within the deposition chamber 30 intermediate the flowing of the first precursor gas and the second precursor gas.

Re claim 40, since Kim expressly discloses FIG. 11 being a continuous feed-back process (step 105 to 145), the plurality of first precursor gas pulses can be more than two (steps 105, 115 & 105 again).

Re claim 41, since Kim discloses the ALD process of FIG. 11 being a continuous feed-back process (step 105 to 145), such process comprises flowing at least one inert purge gas pulse (step 140) to the substrate within the chamber 30 immediately prior to the first precursor flowing (step 105).

Re claims 42 and 43, Kim discloses the first precursor comprises $TiCl_4$ and the second precursor comprises NH_3 or vice versa [see col. 6, line 38-40].

Re claims 49 and 50, Kim discloses the two first precursor gas pulses may be equal in time or unequal in time [see col. 5, line 27-30].

Re claims 52 and 75, see discussion above regarding claims 38, 39 and 74. Kim further discloses forming composite oxides or nitrides comprising at least three precursors (e.g. $SrTiO_3$ and WBN), wherein the precursors are different in composition from each other [see col. 6, line 50-57]. Therefore, in order to form composite oxides or nitrides comprising at least three precursors, the ALD process of FIG. 11 should be modified to include steps of injecting a third precursor and removing physisorbed third precursor.

Re claims 53-55 and 58-60, Kim discloses the step of removing the physisorbed second reactant (step 130) can be performed by purging with nitrogen (inert) gas or pumping the chamber to a vacuum state without purging with nitrogen gas [see col. 6, line 9-12]. Such process of purging or pumping inherently takes at least some period of time to perform. Thus, it is inherent that at least one period of time exists between two adjacent second precursor gas pulses (steps 125 and 135) when no nitrogen gas or some nitrogen gas is fed to the chamber.

Re claims 56 and 57, Kim discloses in FIG. 11 the plurality of second precursor gas pulses being two (steps 125 and 135). However, since Kim discloses the ALD process of FIG.

11 being a continuous feed-back process (step 105 to 145), the plurality of second precursor gas pulses can be more than two.

Re claims 61 and 62, see discussion above regarding claims 52 and 75. In view of such discussion, it can be seen that the ALD process of FIG. 11 comprises flowing multiple time spaced inert purge gas pulses (steps 110, 120, 130 and 140) to the substrate within the chamber intermediate the first precursor flowing (step 105) and the third precursor flowing.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 44 and 45 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim in view of Werkhoven et al. (U.S. Patent No. 6,534,395).

Re claims 44 and 45, Kim discloses using precursors of trimethylaluminum (TMA) and water, instead of TMA and ozone, to form Al_2O_3.

Werkhoven et al. ("Werkhoven") suggests an ALD process that comprises using precursors of TMA and ozone to form Al_2O_3 [see col. 14, line 30-34 & col. 15, line 1-3].

Since Kim and Werkhoven are from the same field of endeavor, the purpose disclosed by Werkhoven would have been recognized in the pertinent prior art of Kim.

Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to modify the method disclosed by Kim by using ozone as a precursor for forming Al_2O_3 as suggested by Werkhoven, since Werkhoven states at column 15, line 1-3 that ozone is an alternative for water.

Claims 46-48 and 51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kim.

Re claims 46-48 and 51, Kim fails to specifically disclose the period of time when no gas is fed to the chamber being less than, equal to or greater than the time of gas flow of each or both of the two first precursor gas pulses.

It would have been obvious to a person of ordinary skill in the art at the time the invention was made to optimize and select an appropriate duration for the period of time when no gas is fed to the chamber relative to the time of gas flow of the two first precursor gas pulses.

The selection of parameters such as energy, power, concentration, temperature, time, depth, thickness, etc., would have been obvious and involve routine optimization which has been held to be within the level of ordinary skill in the art. "Normally, it is to be expected that a change in temperature, or in concentration, or in both, would be an unpatentable modification. Under some circumstances, however, changes such as these may be impart patentability to a process if the particular ranges claimed produce new and unexpected result which is different in kind and not merely degree from results of prior art ... such ranges are termed 'critical ranges' and the applicant has the burden of proving such criticality ... More particularly, where the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation". *In re Aller*, 105 USPQ 233, 235 (CCPA 1955). See also MPEP 2144.05.

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970);and, *In re Thorington,* 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 38-82 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1-36 of U.S. Patent No. 6,673,701 ("the

Patent"). Although the conflicting claims are not identical, they are not patentably distinct from each other because the present application merely broadens the claims of the Patent.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Chung et al. (US 2003/0108674 A1) discloses relevant teachings regarding ALD.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Khanh B. Duong whose telephone number is (571) 272-1836. The examiner can normally be reached on 10:00-6:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Amir Zarabian can be reached on (571) 272-1852. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

KBD

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